CALS TEST NETWORK

CTN Test Report
91-025

DEMONSTRATION REPORT

COMPUTER-ASSISTED TECHNIQUES FOR DIGITAL DATA ACCEPTANCE

Quick Short Test Report

November 2, 1990

Prepared for
CALS Test Network (CTN)
Wright-Patterson AFB OH 45433-5000

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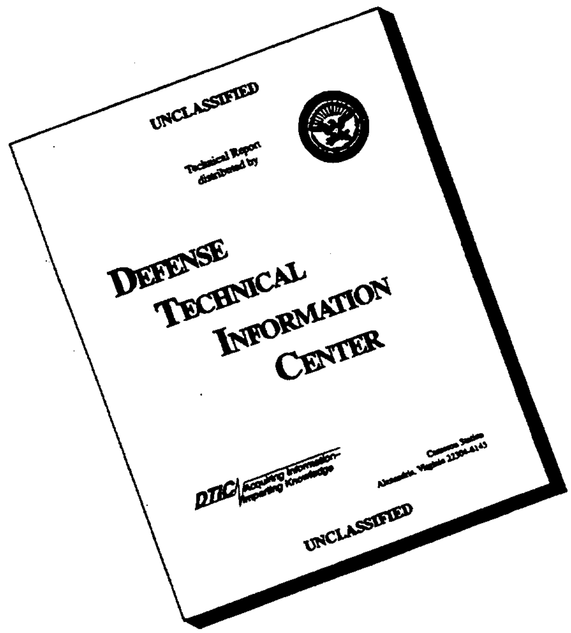

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DEMONSTRATION REPORT

Computer-Assisted Techniques for Digital Data Acceptance

CONTRACT NO. : DAAB07-89-D-A047
TASK NO.: 006 (Data Acceptance)

02 November, 1990

Prepared for

DEPARTMENT OF THE ARMY COMPUTER-AIDED ACQUISITION AND LOGISTIC SUPPORT (CALS)

ACCURATE
Information Systems, Inc.

Meridian Center I • 2 Industrial Way • Eatontown, New Jersey 07724 • (201) 389-5550

October 31, 1990

Department of the Army
Project Manager
Computer-aided Acquisition and Logistic Support (CALS)
Fort Monmouth, New Jersey 07703-5000

ATTENTION: ASPES-CA-T Mr. R. Mitchell

SUBJECT: Demonstration Report

REFERENCES: a. Contract No: DAAB07-89-D-A047
b. Task Execution Plan No: 90-006

Dear Mr. Mitchell:

The purpose of this letter is to forward the subject Demonstration Report as the 2 November 1990 deliverable required by reference b) above.

Please feel free to call me or my designated point of contact William D. White, should you have any questions or require further information concerning this submission.

Sincerely,

Lancy O. Burns
Director of Operations

Enclosure

cc: Dr. J. Tomlinson (w/o enclosure)
Mr. K. Chan
Mr. A. Fairweather
Mr. J. Shealayno'sun
Ms. J. Denton

DEMONSTRATION REPORT

Computer-Assisted Techniques for Digital Data Acceptance

<u>PEO STAMIS</u>

ARMY CALS TEST BED

2 November, 1990

EXECUTIVE SUMMARY

The Data Acceptance (DA) and Quality Assurance (QA) of Engineering Drawing data at government repositories today is a time consuming process that requires considerable human and facility resources. Currently, all engineering drawings must be viewed by an operator at an image workstation. Technology advances in the analysis of digital data offer computer-assisted techniques that can be applied to the DA/QA of engineering drawings and documents. The application of this technology to DA of digital data provides a cost-effective alternative to the interactive viewing of data at an image workstation.

This report describes the techniques that were demonstrated and the potential benefits of applying these computer-assisted techniques to the DA\QA of engineering drawing data.

The areas of concentration, for this demonstration, were Image Quality and Identification Data. The techniques were demonstrated by processing a suite of test data that was scanned into a microprocessor image-based system. This data suite contained light, dark, noisy, skewed and good quality image data. The Image Quality demonstration showed that poor quality images could be detected by use of computer-assisted techniques. The Identification Data demonstration showed how key identification data, such as drawing number and size, can be recognized within the image area.

The demonstrated techniques indicate that the technology available today is applicable to the DA of digital data and are viable options for the improvement of the digital data acceptance process.

Additional evaluation and testing of these and other advanced techniques is recommended.

TABLE OF CONTENTS

1. PURPOSE

This report documents the techniques that were demonstrated and describes other potential techniques that are candidates for the Computer-Assisted acceptance of digital data (DA).

2. SCOPE

This report describes the background that points out the need for computer-assisted data acceptance procedures, the research and analysis of existing techniques/tools, the impact these techniques have on the acceptance of digital data, other advanced techniques under consideration and the results of the demonstration. The need for further testing of the demonstrated techniques and other advanced techniques is addressed in the recommendation section of this report.

3. BACKGROUND

Analysis of existing acceptance procedures at government repositories, the comments from the review of manual data acceptance procedures and their field testing points up the need for automating the acceptance of this digital data. The manual viewing of the digital data on image workstations for QA and acceptance is a time consuming process and requires considerable manpower, hardware/software and facilities resources. When the repository resources are used for full 100% DA/QA of the data, the prime mission of storing, retrieving and distributing data is impacted.

The present, manual efforts, required to develop, store, reproduce and distribute data on aperture card media is costly and due to the handling of the data results in poor quality data that is difficult to reproduce. The production of digital data for new weapon system procurement will greatly improve the quality of the data however the aperture card is still a large source for conversion to digital data. How can the costly, time consuming QA and use of resources be reduced. One alternative, is to maximize the use of computer-assisted techniques to analyze the image data and identification data of the delivered drawing or document.

A number of the manual procedures were identified as candidates for the application of computer-assisted techniques. The two most obvious areas were those of analyzing the image data content for quality and the verification of the identification data that is presented in a number of places (Contractor furnished Data List, 1840A Header and the final repository generated directory/Index data list). Other areas where computer-assisted techniques could be applied were administrative control and use of support data and the many techniques for the retrieval and display of image data.

Technical advancements were researched in the analysis of digital image data and algorthms were reviewed that would be applicable to the acceptance of digital engineering drawing data. A selected few were analyzed and integrated into a common platform for demonstration purposes only. Other advanced techniques are available and the techniques selected for demonstration will require additional testing in a batch mode environment before they could be recommended for production implementation. The results discussed within this report demonstrate the practicality of using such techniques to provide background or off-line computer-assisted acceptance of digital data.

4. THE IMPACT OF USING COMPUTER-ASSISTED TECHNIQUES IN DATA ACCEPTANCE PROCEDURES

The acceptance of digital data requires the visual viewing of the image and identification data on an image monitor. Computer-assisted preparation and display of the key identification data such as drawing number, revision, size and etc has improved the access and display of the data and therefore reduced the time to QA the drawing. Display editing techniques and the use of windows to provide simultaneous display of the key identification data and image data can be used to further reduce the time for viewing and accepting the displayed data.

Greater benefits can be derived in the overall acceptance of the data if the human interaction can be reduced to viewing for final acceptance on a sampling basis only. The objective then is to develop and/or integrate computer-assisted techniques that can analyze the content of the image file for quality. These algorithms must address noise content, contrast, lightness and darkness features based on the size of the image. Statistical analysis algorithms can compare the black pixel/compressed pixels by image size to determine lightness and darkness. If these algorithms can detect poor quality images consistently then this will have a big impact on the time it takes to QA and accept the data. Also if the computer-assisted technique can be implemented to operate in a batch mode and in an unattended manner then this can occur during off peak production hours which will be an additional benefit. A summary of the impact areas are:

1. Manual comparison of Image ID information with the hard copy print out of the key ID data from the computer.

2. Final Acceptance Visual QA (Reduced to sampling only)

3. Data Acceptance/Rejection Letter Preparation

4. Improved productivity on the Repository System
(Greatly increased depending on where the techniques are implemented. i.e., contractors site, stand-alone system or both.)
5. Administrative Report Areas:
   - Data List (Electronic on magnetic tape)
   - Document Identifier Report

- Acceptance/Rejection Reports
- Elimination of other manual reports/acceptance sheets

6. Contractor performance will be more closely monitored with on-site implementation of these computer-assisted procedures and result in improved quality data.

7. In-process technical reviews can utilize the computer-assisted DA procedures by performing in-line data verification when remotely accessing image drawing data from a contractors site or on GFE at the contractors site that have the DA procedures operating.

8. Commonality of DA procedures for CALS data allows implementation of the procedures at various locations depending on the volume of data ordered. This could be a significant cost savings in both labor, training and hardware\software resources.

Figure 1 shows the flow of data. Three areas are highlighted where Computer-Assisted DA could be applied depending on the specific contract requirements.

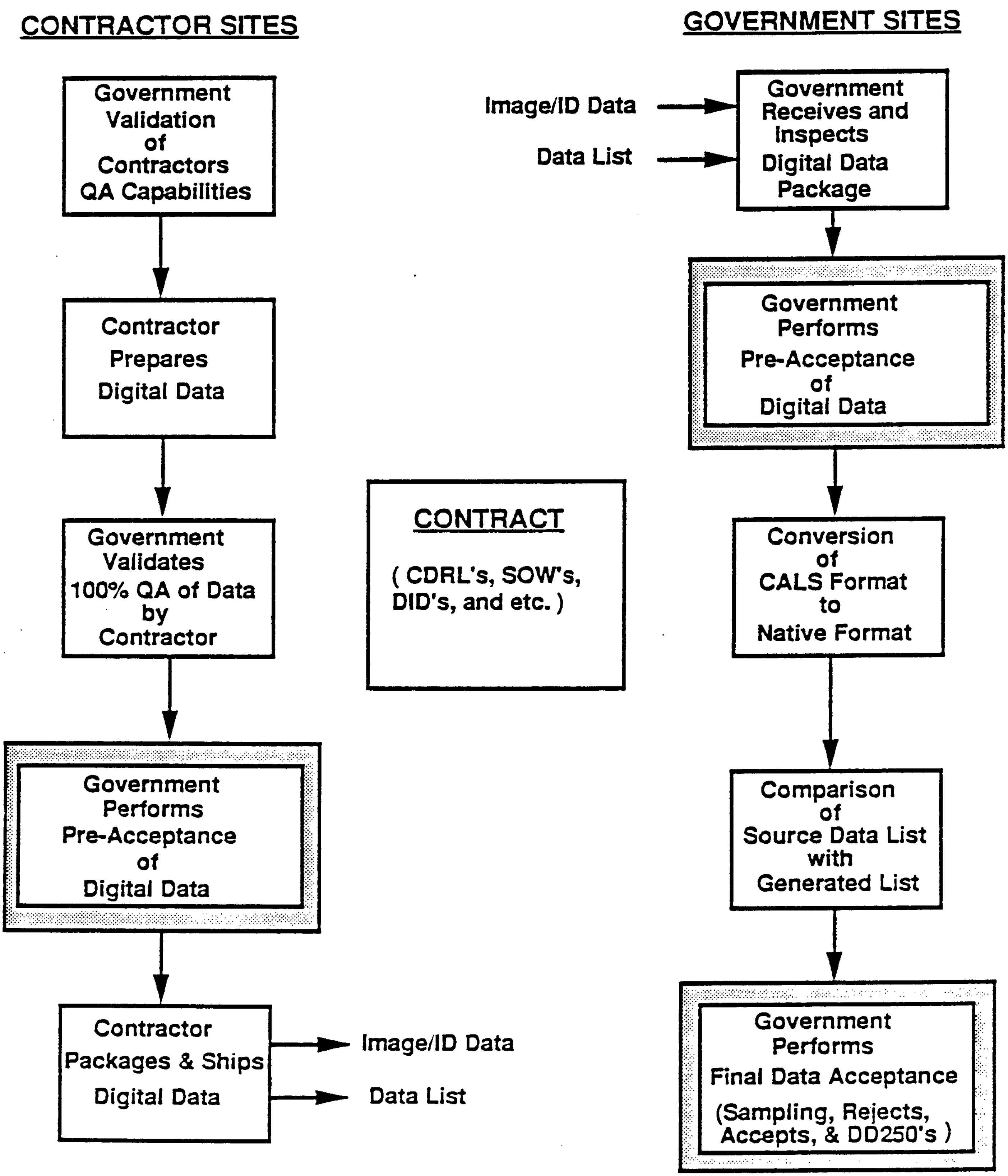

Figure 1 - Data Acceptance/Quality Assurance Process Flow

5. TECHNIQUES DEMONSTRATED

The Demonstration was designed to show how the selected techniques perform and how they may be incorporated in the Data Acceptance/Quality Assurance Procedures. The two major areas addressed were IMAGE QUALITY and IDENTIFICATION DATA MATCHING. Each area will be discussed in the following paragraphs as a background to the detail discussion of the techniques and demonstration environment.

Image Quality inspection involves many different interactions between the person performing the inspection and the image being inspected. The specific approach varies from person-to-person, however the normal process involves the following steps:

STEP 1 is to enter a drawing number as an index or select from an index directory screen to access the image to be inspected. This usually results in a display of the lower right-hand portion of the drawing on the screen.

STEP 2 will pan the screen "window" around the drawing so that the operator can check the overall legibility of the image area and if satisfactory will then check the border areas, revision block, if present, and start to observe the "legibility" of the text and geometry within the borders.

STEP 3 will investigate any suspected problems by "zooming-in" to magnify the area in question. Reject conditions will be collected for a formal rejection notice.

STEP 4 will visually locate each of the key identification fields within the image area and visually compare each with a machine representation of the field as taken from the aperture card punch fields or by key entry. For CALS data, the identification data is located in the header of the magnetic tape format. The identification fields compared in this manner are, at a minimum:

- Engineering Drawing Size (A,B,C,. etc.)
- Engineering Drawing Number
- Revision Number

- FSCM Number (Contractors' group code)
- Sheet Number

Other fields may be checked depending on the specific contract requirements and site policies.

STEP 5 completes the inspection with release of the image, as acceptable or unacceptable, from the screen to prepare for the next. The operator marks-up the data list for the current batch to reflect the inspection of the image.

The major areas were studied separately and the essential process in each was defined. In the case of Image Quality the essential process is the overall assessment of contrast and sharpness. The image is considered to be the foreground and the other "color" (black or white) the background. Thus, with a white or clear background each picture element consists of a black or opaque area. The size of this "pixel" depends on the resolution used when the original image was digitized. The standard resolution for engineering drawings is 200 dots per inch.

A line drawn one pixel wide would be .005 inches or about like a sharp pencil line. The minimum engineering drawing line width is .010 to .012 inches and therefore should be "seen" by the scanner under normal conditions. From the point of initial capture, through reproduction, and digitization and storage there is the opportunity for image degradation.

The types of degradation that could be detected by computer-assisted techniques were identified as Light, Dark, Noisy, and Skewed. These interact with all areas and features of the image and represent a first approach to Computer-Assisted Inspection of Engineering Drawings. It should be noted here that localized areas and features that become impaired, depending on size and degree of impairment will not be detected by large area and statistical methods. It is possible to subdivide the image in order to concentrate the inspection and be more precise (See Section 6 - Advanced Techniques Under Consideration).

The demonstration shows how the image quality and identification data can be verified by use of Computer-Assisted techniques and thereby reduce the requirement for operator QA of all images. Final DA will still be performed by an operator but can be reduced to inspection of questionable data and sampling of acceptable data. A description of the demonstrated Image Quality algorithms follows.

To address the light and dark analysis, an algorithm (patent pending) was investigated that had been originally developed for QA processing during the digitization of drawings. This algorithm has been re-hosted to an Apple II platform and merged with the Blueridge Technologies OPTIX system for Phase II Data Acceptance. (See Figure 2 - Statistical Analysis (B/C), Courtesy of StapleVision Inc.)

Enhancements to this algorithm include a ranking reject mechanism, a forward and reverse averaging mechanism and the ability to apply a batch control process to the image stream. Based on site policy or contract guidance an arbitrary percentage of the batch may be marked for manual inspection, starting with the highest and lowest extremes and working toward the center. This says that regardless of the evaluation or re-evaluation decisions, the image may be rejected due to the ranking reject parameter. As an example, if ranking reject was set to 5% for a 200 image batch then the 10 "worst" images will be rejected (See Appendix D - Ranking Reject Sample).

The evaluation of an image is performed by determining the ratio of total black pixels in the image (B) and the Group IV compression factor(C). This B/C statistic is compared with an expected value and a good/bad decision is made. Based on the forward average number n, this image will be re-evaluated n images later. This provides a smoothing effect for a sudden shift in image values within a batch. The same type of operation is applied with the reverse average number. After each batch is processed the running averages are reset. Multiple batches may be processed in one session (background). Each decision is output to a batch log file for subsequent reduction and presentation.

The following chart shows the results of processing a set of aperture card images using the statistical algorithm (B/C). The X axis is the Log of the compression ratio. The range of compression ratios for Engineering Drawings is normally from 2 to 50 with most images falling in the 8 to 20 area. The Y axis plots the log of the Fill-Factor or, in other words, the number of black pixels in the image area.

Drawings that are very light will produce both a low compression ratio and a low black count. Drawings that contain a lot of geometry and/or text will have a higher black count and usually a low compression ratio due to the large number of transitions. The other extremes are "Sparse" and "Dark" images.

It should be noted that the scatter of data shows a pronounced orthogonal aspect to the "Light - Dark" axis and is grouped along the "Sparse - Busy" axis. The testing verified that images falling out of the "band" were of lower quality.

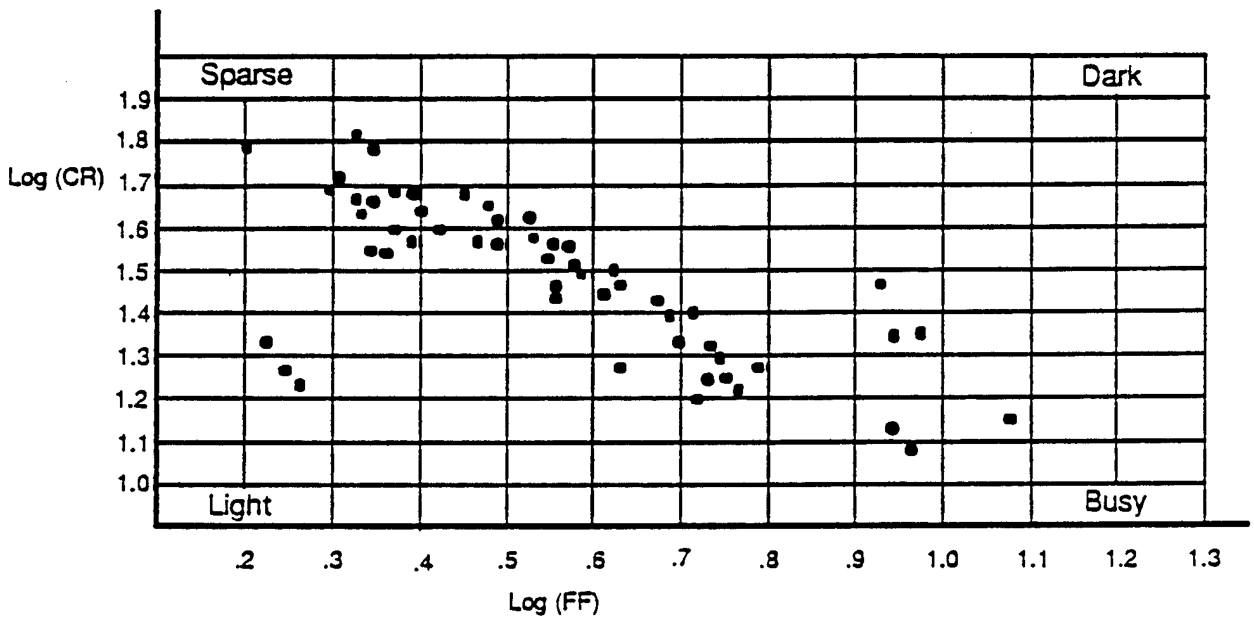

Figure 2 - Statistical Analysis (B/C)

The preceding statistical analysis algorithm requires a total black count for each image. These values are generated and passed by the Noise Analysis and Verticality Analysis package which will now be discussed.

The Noise Analysis algorithms as implemented in the Image Management platform predicts the acceptability of an image by looking for black and white "orphans". An orphan is defined, currently, as a single pixel surrounded by pixels of the other color. The algorithm treats white orphans as much more indicative of an impaired image than black orphans. This would be reversed with a negative image and says that the foreground contains the intelligence and that "drop-outs" may indicate an out-of-focus or scanner problem. This process also generates the total black count needed by the Statistical Analysis (B/C) algorithm.

Enhancements considered for this algorithm would support batch mode operation along with a parameter to adjust decision threshold. Multiple pixel orphan detection should be considered after additional testing.

A skew analysis algorithm was embedded in the Noise Analysis package to process the Group IV compression codes. By grouping and determining run length patterns the algorithm is able to detect both direction and intensity of the skew condition. This information and noise analysis detail are recorded in a QC log for later reduction and presentation.

The next major area addressed is the Computer-Assisted processing of Key Identification Data. As was mentioned in the description of manual data inspection Step 4, the key identification fields must be compared visually between the image and the character data to be sure that the data is accurate.

A survey was conducted of commercially available Intelligent Character Recognition systems and any use of character recognition and pattern recognition with engineering drawings. It was found that some very capable commercial systems exist that could do some of the work needed (See Appendic C for samples). New technology (e.g., neural networks) is reaching the point of effective incorporation in the next several years.

A number of companies working in the field of engineering drawing conversion have addressed recognition and conversion of engineering drawing text and related symbols. AUDRE Inc. of San Diego CA has provided evaluation hardware and software for symbol and character recognition at the Army CALS Test Bed, Fort Monmouth NJ. The HP/Apollo system is used to demonstrate the techniques of symbol recognition and character recognition that, with support modules, can assist in the matching of Key Identification fields within the image of an engineering drawing.

It may help to look at the problems of recognition of engineering drawing text. First, the problem is complicated by the need to search an area that is not always the same location. A production system would need an "expert" capability to handle the many variables associated with finding the Title Block area and navigating around the image to isolate and segment the fields to be recognized.

One of the more serious obstacles to recognition is handprinted characters. The technology is available today to do a limited level of handprint recognition. Research has been specialized and proprietary, addressing check readers and forms readers. It appears, from the current level of activity, that within the next

two years, handprint recognition suitable for DA/QA applications will be available. The demonstration establishes the basic techniques and initial procedures for Computer-Assisted identification data matching.

The first section of the demonstration made use of the Mac IIcx, scanner and Image Management System, containing the Noise, Skew, and Statistical algorithms to show the effect of scanning a "light", "Dark", "Skewed", and "normal" hardcopy drawing.

The system was able to discriminate and report the abnormal and normal drawings. Next, a batch of about forty images were processed to show the operation of accepting and rejecting images within the confines of a batch. The report generated by the B/C algorithm was viewed and discussed. The effect of the various parameter settings was shown and questions answered about the overall integration plans for the set of algorithms.

The demonstration of Identification Field recognition was performed on the HP/Apollo platform. In this portion of the demonstration, patterns were selected for recognition in three drawings. The patterns were the size field characters "A" and "B", the code identification number "80063" and the label "code ident. no." The drawings consisted of an A-size drawing scanned in the portrait orientation, an A-size drawing scanned in the landscape orientation and a B-size drawing scanned in the landscape orientation. By using the interactive recognition processor routine of the AUDRE system, the patterns were recognized and the patterns' coordinates were written to a file. This is the initial step in locating and isolating the Title Block area. The interactive process can be duplicated using a batch process so that pattern recognition can be executed in the background or during off-peak hours.

The next section will describe Advanced Techniques, consisting of extensions and expansions of the demonstration techniques as well as new techniques that may be investigated and proposed for integration in the future.

6. ADVANCED TECHNIQUES UNDER CONSIDERATION

The term, Advanced Techniques is used to describe both extensions to previously defined Techniques (Identification Field recognition, Image Quality and Data List Automation) and new techniques not addressed to date. Candidates for consideration are:

- Improved Operator Display Techniques for QA
- DA/QA Report Generation Requirements
- Tiled Raster QA Techniques (28002, Type II and EDMICS)
- IGES QA Techniques (28000)
- CGM QA Techniques (28003)
- SGML QA Techniques (28001)
- Image Restoration Techniques and Issues
- Digital Signatures for Data Acceptance

The requirements for extension and testing of current techniques are discussed next, followed by a description of how new candidates will be handled.

Image Quality extensions proposed for the areas of Noise Analysis, Statistical Analysis, and Skew Analysis concentrate on providing a shell under which all of the techniques can be exercised and produce a consolidated report. The report would summarize and, where possible, graphically display the results. To explain further, given a batch of images and related header information as input, (e.g., 1840A) each technique would be applied serially with a resultant consolidated report record output for each image. The report records would then be processed to produce a batch or multi-batch report.

The package, including the shell, would be modular such that additional quality techniques could be easily added and the report module could be tailored by site policy and/or contract requirements.

Extensions to the individual techniques include consideration of multiple pixel noise analysis; measurement of the degree of skew; and ability to sample selective areas within an image for B/C calculation. Data List automation will be extended as necessary. Testing and documentation of the techniques and extensions is planned for FY91.

7. CONCLUSION

The techniques demonstrated show how the image quality and the key identification data can be analyzed to provide data acceptance by use of computer-assisted means and thereby reduce the requirement to visually QA each image for acceptance.

The techniques demonstrated have not been fully tested and other techniques are available that require evaluation. The demonstration does show that the techniques are valid and deserving of further evaluation. Further testing using a suite of test data that ranges from very light images to very dark images is required. Integration of the tested techniques will required testing at a higher level before the techniques are implemented in a real-time data acceptance production environment.

The demonstration is the first phase in the evaluation of computer-assisted techniques that can be applied to pre-acceptance of digital engineering drawing data either at the contractor site or at the user site. The recognition of the key-ID data within the image area is a valid step to take now as the technology is improving. As more and more of the engineering drawing data are developed from CAD or CAE workstations, the character data will be less difficult to detect when compared with some of the hand written data originating from 3rd or 4th generation aperture cards.

The demonstration supports the belief that technology is available that can be cost-effectively applied to the acceptance of digital engineering drawing data.

8. RECOMMENDATIONS

The techniques demonstrated prove that the technology can be applied to the acceptance of digital data however these techniques and others must be tested individually and in an integrated mode. This requires that a wide range of data be used and extensive analysis of the results be made before specific techniques can be recommended for implementation.

A great deal of work is being done within industry and at the University level in the digital imaging area. These advanced techniques should be reviewed for direct application to the acceptance of digital data. Further analysis of a selected few may be required and if warranted, testing conducted.

It is important that the CALS test beds and the tri-services repositories be involved in the application of the computer-assisted techniques to the acceptance of digital data and therefore further demonstrations should be scheduled and the results of the testing be documented and distributed for their inputs.

It is therefore recommended that:

1. More extensive testing of the demonstrated techniques be accomplished.

2. Review and Analysis of Advanced Techniques for computer-assisted data acceptance be made.

3. Further Demonstrations be conducted with more involvement of the CALS community and the CTN participants in particular.

APPENDIX A

Appendix A contains the set of overheads used in the demonstration.

Introduction To Computer-Assisted Techniques For Digital Data Acceptance

- Background: Data Acceptance/Quality Assurance - Engineering Drawing Data
  - Original Drawings (Hardcopy)
  - Microform (Microfiche, Roll Film, Aperture Cards)
  - Quality and Conversion (Hardcopy to Microform)
  - Quality and Conversion (Microform to Digital Data)
  - Micrographics Standards for Production and Inspection

Introduction To Computer-Assisted Techniques For Digital Data Acceptance

- **Current Data Acceptance/Quality Assurance Practices (DSREDS, EDCARS and EDMICS)**
  - **Inspecting and Accepting Engineering Drawing Data - Hardcopy/Microform/Digital**
  - **Conversion: Aperture Card Data to Digital Data**

Introduction To Computer-Assisted Techniques For Digital Data Acceptance

- **Digital Data Acceptance/Quality Assurance - Manual Vs Computer - Assisted**
  - **Contractor to User: Manual Digital DA/QA Procedures**
  - **Contractor to User: Computer-Assisted DA/QA Procedures**
  - **Benefits of Computer-Assisted DA Procedures**

Introduction To Computer-Assisted Techniques For Digital Data Acceptance

- **Areas Selected for Presentation/Demonstration of Computer-Assisted Techniques**
  - **Media Format Verification**
  - **Identification Data Verification**
  - **Image Quality Verification**
  - **Administrative Data Control**
  - **Display Presentation**

Computer-Assisted Data Acceptance

VERIFICATION TESTS

— Media Format —

VERIFICATION TESTS

— Identification Data —

VERIFICATION TESTS

— Image Quality —

ADMINISTRATIVE TESTS

— Data Control —

WORKSTATION DISPLAYS

Presentation Techniques

Demonstration Techniques Overview

- Noise Analysis (Black and White Orphans)
- Verticality Analysis (Skew)
- Statistical Analysis (B/C)
- Pattern Recognition (Key ID Fields)
- Character Recognition (Machine and Handprint)
- Benefits of Image Quality and Recognition Techniques
- Demonstration Configuration and Phase III Issues
- Open Discussion of Computer-Assisted Techniques

Demonstration Techniques Overview

- **Noise Analysis (Black and White Orphans)**
  - Noise sources
  - Single and multiple pixel algorithms
  - Demonstration implementation
  - Extension possibilities

- **Verticality Analysis (Skew)**
  - Source of skewed images
  - Compressed image algorithm
  - Demonstration implementation
  - Extension possibilities

Demonstration Techniques Overview

- **Statistical Analysis (B/C)**
  - Source of image impairment
  - B/C statistic development
  - Demonstration implementation
  - Extension possibilities

Demonstration Techniques Overview

- **Pattern Recognition (Key ID Fields)**
  - **Open field recognition vs constrained fields**
  - **Machine vision analogy**
  - **Demonstration implementation**
  - **Extension possibilities**

- **Character Recognition (Machine and Handprint)**
  - **Commercial OCR progress**
  - **New Technologies**
  - **Demonstration implementation**
  - **Extension possibilities**

Demonstration Techniques Overview

- Benefits of image Quality and Recognition Techniques
  - Pre-screening (batch) processing
  - Reduction of key ID and quality inspection time
  - Early detection of major delivery problems and trends
  - Extensible and expandable techniques
  - Interface to other logistics support systems

Demonstration Techniques Overview

- Demonstration Configuration
  - Mac IIcx - scanner - laser printer
  - HP/Apollo with recognition logic
  - Blueridge image-processing software with quality algorithms
  - Staplevision software algorithms
  - AUDRE Inc. (Recognition Hardware and Software)
- Phase III Computer- Assisted Techniques - Issues
  - Extension and expansion of Phase II techniques
  - Incorporation of new techniques
  - Joint service evaluation of techniques
  - Verification of selected techniques
  - Amendments to CALS specifications
  - Application of techniques to other data formats

Army CALS Test Bed DEMONSTRATION 26 October, 1990

Demonstration Techniques Overview

- Open Discussion of Computer-Assisted Techniques
  - Additional candidates for consideration
  - Similar or related efforts
  - Recommendations for extension
  -
  -
  -
  -
  -

APPENDIX B

Appendix B contains sample drawings showing normal, light, dark and skewed conditions.

4.1.7.1 SAMPLING FOR GROUP C INSPECTION OF EQUIPMENT: ONE UNIT OF EACH 40 UNITS OR FRACTION THEREOF SHALL BE RANDOMLY SELECTED FOR GROUP C INSPECTION.

4.1.7.2 NONCOMPLIANCE: THE CONTRACTOR SHALL IMMEDIATELY REPORT IN WRITING EACH GROUP C FAILURE OCCURRENCE, INCLUDING DETAILS OF THE FAILURE AND CHARACTERISTICS AFFECTED. THE CONTRACTOR SHALL IMMEDIATELY INVESTIGATE THE CAUSE OF FAILURE AND REPORT THE RESULTS OF INVESTIGATION AND DETAILS OF THE PROPOSED CORRECTIVE ACTION ON (I) THE PROCESS AND MATERIALS, AS APPLICABLE, AND (II) ALL UNITS OF PRODUCT WHICH WERE MANUFACTURED UNDER THE SAME CONDITIONS AND WHICH THE GOVERNMENT CONSIDERS SUBJECT TO THE SAME FAILURE. REPORTS SHALL BE FORWARDED TO THE RESPONSIBLE TECHNICAL ACTIVITY DESIGNATED IN THE CONTRACT, THROUGH THE QUALITY ASSURANCE REPRESENTATIVE. AFTER CORRECTIVE ACTION HAS BEEN TAKEN, ADDITIONAL SAMPLE UNITS SHALL BE SUBJECTED TO GROUP C INSPECTION, AND GROUPS A AND B INSPECTION MAY BE REINSTUTUTED AS DEEMED NECESSARY BY THE GOVERNMENT. FINAL ACCEPTANCE AHD SHIPMENT WILL BE WITHHELD UNTIL REINSPECTION RESULTS HAVE SHOWN THAT THE CORRECTIVE ACTION WAS EFFECTIVE.

4.1.7.3 DISPOSITION OF UNITS SUBJECT TO GROUP C TESTS: UNITS THAT HAVE BEEN SUBJECTED TO GROUP C TESTS SHALL BE RECONDITIONED AS NECESSARY AND WILL BE TESTED FOR COMPLIANCE TO GROUP A TESTS AND SUBMITTED FOR ACCEPTANCE FOR DELIVERY.

4.2 INSPECTION AND TEST EQUIPMENT REQUIRED

DIRECTIONAL COUPLER HP-776D
NOISE FIGURE METER HP-340B
NOISE SOURCE HP-349A
50 OHM TERMINATION - MICROLAB TA-5MN
FREQUENCY COUNTER - HP5245L WITH 5254B CONVERTER
POWER SUPPLY: 6.3 VAC, 150 VDC AND 250 VDC
DC MILLIAMMETER: 0-30 MA; WESTON 311
SECOND IF SIMULATOR (PER FIG. 4)
POWER METER HP-432A W/MOUNT
ATTENUATOR 20 DB GR-874-G20
TUNING DRIVE ASSEMBLY - SM-D-498288
TUNED CAVITY ASSEMBLY - SM-C-422385
MIXER ASSEMBLY - SM-D-423156
1ST IF ASSEMBLY - SM-D-422489
TEMPERATURE CHAMBER CAPABLE OF - 80°F TO +168°F (STABILITY ±5°F OR BETTER)
MISC. CABLES AND ADAPTER CONNECTORS AS REQUIRED
CABLE CG-718 B/U - SC-D-35185
FILTER, LOW PASS - SM-B-422562-1
HUMIDITY CHAMBER
SPECIAL CABLE PER FIG. 5
SHOCK TEST MOUNT PER FIG. 6
AC CURRENT METER CAPABLE OF READING 0.1 TO 0.2 AMPS WITH 5% ACCURACY OR BETTER

SIZE	CODE IDENT. NO.	
A	80063	SM-A-498336
SCALE: N/A	LTR	SHEET 8

4.1.7.1 Sampling for Group C inspection of equipment: One unit of each 40 units or fraction thereof shall be randomly selected for Group C inspection.

4.1.7.2 Noncompliance: The contractor shall immediately report in writing each Group C failure occurrence, including details of the failure and characteristics affected. The contractor shall immediately investigate the cause of failure and report the results of investigation and details of the proposed corrective action on (I) the process and materials, as applicable, and (II) all units of product which were manufactured under the same conditions and which the Government considers subject to the same failure. Reports shall be forwarded to the responsible technical activity designated in the contract, through the Quality Assurance Representative. After corrective action has been taken, additional sample units shall be subjected to Group C inspection, and Groups A and B inspection may be reinstituted as deemed necessary by the Government. Final acceptance and shipment will be withheld until reinspection results have shown that the corrective action was effective.

4.1.7.3 Disposition of units subject to Group C Tests: Units that have been subjected to Group C tests shall be reconditioned as necessary and will be tested for compliance to Group A tests and submitted for acceptance for delivery.

4.2 Inspection and Test Equipment Required

Directional Coupler HP-776D
Noise Figure Meter HP-340B
Noise Source HP-349A
50 Ohm Termination - Microlab TA-5MN
Frequency Counter - HP5245L with 5254B Converter
Power Supply: 6.3 VAC, 150 VDC and 250 VDC
DC Milliammeter: 0-30 MA; Weston 311
Second IF Simulator (Per Fig. 4)
Power Meter HP-432A W/Mount
Attenuator 20 dB GR-874-G20
Tuning Drive Assembly - SM-D-498288
Tuned Cavity Assembly - SM-C-422385
Mixer Assembly - SM-D-423156
1st IF Assembly - SM-D-422487
Temperature Chamber capable of - 80°F to +168°F (Stability ±5°F or better)
Misc. Cables and Adapter Connectors as required
Cable CG-718 B/U - SC-D-35185
Filter, Low Pass - SM-B-422562-1
Humidity Chamber
Special Cable per Fig. 5
Shock Test Mount per Fig. 6
AC current meter capable of reading 0.1 to 0.2 Amps with 5% accuracy or better

SIZE	CODE IDENT. NO.	
A	80063	SM-A-498336
SCALE: 1/4	LTR	SHEET 8

WHEN REFERRING TO THIS DRAWING STATE DRAWING NO. ...

4.1.7.1 SAMPLING FOR GROUP C INSPECTION OF EQUIPMENT: ONE UNIT OF EACH 40 UNITS OR FRACTION THEREOF SHALL BE RANDOMLY SELECTED FOR GROUP C INSPECTION.

4.1.7.2 NONCOMPLIANCE: THE CONTRACTOR SHALL IMMEDIATELY REPORT IN WRITING EACH GROUP C FAILURE OCCURRENCE, INCLUDING DETAILS OF THE FAILURE AND CHARACTERISTICS AFFECTED. THE CONTRACTOR SHALL IMMEDIATELY INVESTIGATE THE CAUSE OF FAILURE AND REPORT THE RESULTS OF INVESTIGATION AND DETAILS OF THE PROPOSED CORRECTIVE ACTION ON (I) THE PROCESS AND MATERIALS, AS APPLICABLE, AND (II) ALL UNITS OF PRODUCT WHICH WERE MANUFACTURED UNDER THE SAME CONDITIONS AND WHICH THE GOVERNMENT CONSIDERS SUBJECT TO THE SAME FAILURE. REPORTS SHALL BE FORWARDED TO THE RESPONSIBLE TECHNICAL ACTIVITY DESIGNATED IN THE CONTRACT, THROUGH THE QUALITY ASSURANCE REPRESENTATIVE. AFTER CORRECTIVE ACTION HAS BEEN TAKEN, ADDITIONAL SAMPLE UNITS SHALL BE SUBJECTED TO GROUP C INSPECTION, AND GROUPS A AND B INSPECTION MAY BE REINSTITUTED AS DEEMED NECESSARY BY THE GOVERNMENT. FINAL ACCEPTANCE AND SHIPMENT WILL BE WITHHELD UNTIL REINSPECTION RESULTS HAVE SHOWN THAT THE CORRECTIVE ACTION WAS EFFECTIVE.

4.1.7.3 DISPOSITION OF UNITS SUBJECT TO GROUP C TESTS: UNITS THAT HAVE BEEN SUBJECTED TO GROUP C TESTS SHALL BE RECONDITIONED AS NECESSARY AND WILL BE TESTED FOR COMPLIANCE TO GROUP A TESTS AND SUBMITTED FOR ACCEPTANCE FOR DELIVERY.

4.2 INSPECTION AND TEST EQUIPMENT REQUIRED

DIRECTIONAL COUPLER HP-776D
NOISE FIGURE METER HP-340B
NOISE SOURCE HP-345A
50 OHM TERMINATION - MICROLAB TA-5NM
FREQUENCY COUNTER - HP5245L WITH 5254B CONVERTER
POWER SUPPLY: 6.3 VAC, 150 VDC AND 250 VDC
DC MILLIAMMETER: 0-30 MA: WESTON 311
SECOND IF SIMULATOR (PER FIG. 4)
POWER METER HP-431B W/MOUNT
ATTENUATOR 20 DB GR-874-G20
TUNING DRIVE ASSEMBLY - SM-D-498288
TUNED CAVITY ASSEMBLY - SM-C-422385
MIXER ASSEMBLY - SM-D-423156
1ST IF ASSEMBLY - SM-D-422489
TEMPERATURE CHAMBER CAPABLE OF - 80°F TO +168°F (STABILITY ±5°F OR BETTER)
MISC. CABLES AND ADAPTER CONNECTORS AS REQUIRED
CABLE CG-71B B/U - SC-D-55185
FILTER, LOW PASS - SM-B-422562-1
HUMIDITY CHAMBER
SPECIAL CABLE PER FIG. 5
SHOCK TEST MOUNT PER FIG. 6
AC CURRENT METER CAPABLE OF READING 0.1 TO 0.2 AMPS WITH 5% ACCURACY OR BETTER

SIZE	CODE IDENT. NO.	
A	80063	SM-A-498536
SCALE: N/A	LTR	SHEET 8

WHEN REFERRING TO THIS DRAWING STATE DRAWING NO. AND ITEM & ISSUE / STYLE NO. AND NAME

SYM	REVISIONS	AUTH
A	REVISED 25 OCT 68	ER-Z V.L.
B	REVISED 25 JUN 69 68-C-0304	ER-Z V.L.
C	15 FEB 74	ED

EQUIPMENT: GENERATOR, REF. SIG PART OF KY-564/TKQ-2 (613-PM-62)

DEPARTMENT OF THE ARMY
U.S. ARMY SIGNAL MATERIEL SUPPORT AGENCY
FORT MONMOUTH NEW JERSEY

DRAWING AND DATA LIST

THIS DRAWING AND DRAWINGS AND PUBLICATIONS REFERENCED AND THEIR SUBSIDIARIES, IF ANY, CONSTITUTE ALL THE NECESSARY DATA RELATING TO DRAWINGS

	TITLE	NUMBER	REV.SYM	
*	CHASSIS ASSY-REFERENCE-SIGNAL GENERATOR	SM-D-497103	B	
	FRAME, TOP-REF SIGNAL GEN	SM-D-497104 (2 SH)	A	
*	COMPONENT BOARD ASSY-GENERATOR REFERENCE SIGNAL	SM-D-497105 (2 SH)	~~X~~	G
*	PRINTED WIRING BOARD-ASSY	SM-D-497106		
*	WIRING HARNESS, BRANCHED-ASSEMBLY-GENERATOR, REFERENCE SIGNAL	SM-D-497146 (2 SH)	B	
*	TEST PROCEDURE FOR REFERENCE SIGNAL GENERATOR (3A3)	SM-A-497478 (8 SH)	C	
*	TEST PROCEDURE RESULTS FOR REFERENCE SIGNAL GENERATOR (3A3)	SM-A-497479 (4 SH)	A	
*	SHIM, COMPONENT BOARD - TOP	SM-C-497633		
*	SHIM, COMPONENT BOARD - BOTTOM	SM-C-497634		
*	SHIM, COMPONENT BOARD - SHORT	SM-B-497635		
	ASSOCIATED TEST REQUIREMENTS DRAWINGS			
*	LEAD, ASSY, ELEC (TEST SET)	SM-D-497202		
	MASTER PLATE DRAWINGS			
	(NOT FURNISHED FOR BIDDING PURPOSES, FURNISHED UPON REQUEST BY CONTRACTOR)			
*	MASTER PLATE FOR SM-J-496651 (FRONT)	MP3422		A
*	MASTER PLATE FOR SM-J-496651 (BACK)	MP3423		A

DRWN: JR | CHKD: MW | APPD: ER-Z V.L. | REVD: ER-Z V.L.

USED ON: GENERATOR, REFERENCE SIGNAL PART OF KY-564( )/TKQ-2

SC-DL-496859
SHEET- 2
CODE IDENT 80063

APPENDIX C

Appendix C contains samples of drawings with the title block "clipped" and the resulting character recognition results. Each page has three sections:

1. A portion of the original drawing.

2. A "clipped" segment of the drawing used for recognition.

3. The characters that the recognition system resolved.

DESCRIPTION | SPECIFICATION

.T OF PARTS :

~~/IDES~~ ~~CORP.~~

< NO.
·PP-60

DATE

U. S. ARMY ELECTRONICS COMMAND
PROCUREMENT & PRODUCTION DIRECTORATE
FORT MONMOUTH, NEW JERSEY 07703

FORM

ED: PME

20 JUL 61

SIZE	CODE IDENT NO.	
B	80063	SM-B-389881
SCALE 1/2		SHEET

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.OCUREMENT & PRODUCTION DIRECTORATE
FORT MONMOUTH, NEW JERSEY 07703

FORM

CODE IDENT NO.	
80063	SM-B-389881
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U.S. ARMY ELECTRONICS COMMAND
t)CUREMENT ~r PRODUCTION DIRECTORATE
FORT MONMOUTH, NEW JERSEY 07703

FORM

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-R FIG. 3, ADJUST
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, TO 1540.5 MHz. THE CHANNEL
± 10. RECORD.

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A	80063	SM-A-498336
SCALE: N/A	LTR	SHEET 9

THIS DRAWING STATE DRAWING NO., APPLICABLE ISSUE LETTER IF ANY, AND DATE

SIZE	CODE IDENT. NO.	
A	80063	SM-A-498336
SCALE: N/A	LTR	SHEET 9

TE DRAWING NO., APPLICABLE ISSUE LETTER IF ANY, AND DATE

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A 8006~ SM-A-498336
• SCALE N/A I LTR I SHEET 9

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APPENDIX D

Appendix D contains samples of the Ranking Reject report and records from the Statistical Analysis B/C and Noise/Skew Analysis.

RANKING IMAGES...REJECTING 040 OUT OF 046 IMAGES

IMAGE FILE Hard Disk:OPTIX:Light Images:Image10 REJECTED,	B/C=0.580961, No.0028
IMAGE FILE Hard Disk:OPTIX:Dark Images:Image7 REJECTED,	B/C=2.445409, No.0016
IMAGE FILE Hard Disk:OPTIX:Light Images:Image4 REJECTED,	B/C=0.669436, No.0022
IMAGE FILE Hard Disk:OPTIX:tt,images,L71 REJECTED,	B/C=2.404949, No.0044
IMAGE FILE Hard Disk:OPTIX:Light Images:Image3 REJECTED,	B/C=0.725080, No.0020
IMAGE FILE Hard Disk:OPTIX:Dark Images:Image6 REJECTED,	B/C=2.213266, No.0015
IMAGE FILE Hard Disk:OPTIX:Light Images:Image1 REJECTED,	B/C=0.751883, No.0018
IMAGE FILE Hard Disk:OPTIX:Dark Images:Image5 REJECTED,	B/C=1.921259, No.0014
IMAGE FILE Hard Disk:OPTIX:tt,images,L67 REJECTED,	B/C=0.766237, No.0040
IMAGE FILE Hard Disk:OPTIX:tt,images,L70 REJECTED,	B/C=1.886116, No.0043
IMAGE FILE Hard Disk:OPTIX:tt,images,L64 REJECTED,	B/C=0.770421, No.0037
IMAGE FILE Hard Disk:OPTIX:Dark Images:Image2 REJECTED,	B/C=1.852761, No.0010
IMAGE FILE Hard Disk:OPTIX:Light Images:Image5 REJECTED,	B/C=0.772054, No.0023
IMAGE FILE Hard Disk:OPTIX:Dark Images:Copy of Imag REJECTED,	B/C=1.794493, No.0012
IMAGE FILE Hard Disk:OPTIX:tt,images,L58 REJECTED,	B/C=0.772478, No.0031
IMAGE FILE Hard Disk:OPTIX:Dark Images:Image8 REJECTED,	B/C=1.756459, No.0017
IMAGE FILE Hard Disk:OPTIX:tt,images,L60 REJECTED,	B/C=0.776121, No.0033
IMAGE FILE Hard Disk:OPTIX:Dark Images:Image3 REJECTED,	B/C=1.683893, No.0011
IMAGE FILE Hard Disk:OPTIX:tt,images,L61 REJECTED,	B/C=0.776151, No.0034
IMAGE FILE Hard Disk:OPTIX:Dark Images:Image4 REJECTED,	B/C=1.634968, No.0013
IMAGE FILE Hard Disk:OPTIX:tt,images,L65 REJECTED,	B/C=0.794734, No.0038
IMAGE FILE Hard Disk:OPTIX:tt,images,L69 REJECTED,	B/C=1.606735, No.0042
IMAGE FILE Hard Disk:OPTIX:Light Images:Image8 REJECTED,	B/C=0.806825, No.0026
IMAGE FILE Hard Disk:OPTIX:Good Images:Copy of Imag REJECTED,	B/C=1.527753, No.0003
IMAGE FILE Hard Disk:OPTIX:tt,images,L62 REJECTED,	B/C=0.812168, No.0035
IMAGE FILE Hard Disk:OPTIX:Good Images:Image2 REJECTED,	B/C=1.515312, No.0001
IMAGE FILE Hard Disk:OPTIX:tt,images,L66 REJECTED,	B/C=0.852001, No.0039
IMAGE FILE Hard Disk:OPTIX:Good Images:Image7 REJECTED,	B/C=1.494251, No.0007
IMAGE FILE Hard Disk:OPTIX:Light Images:Image2 REJECTED,	B/C=0.892151, No.0019
IMAGE FILE Hard Disk:OPTIX:Good Images:Image8 REJECTED,	B/C=1.470714, No.0008
IMAGE FILE Hard Disk:OPTIX:tt,images,L63 REJECTED,	B/C=0.899220, No.0036
IMAGE FILE Hard Disk:OPTIX:Good Images:Image5 REJECTED,	B/C=1.462168, No.0005
IMAGE FILE Hard Disk:OPTIX:Light Images:Image6 REJECTED,	B/C=0.944345, No.0024
IMAGE FILE Hard Disk:OPTIX:Dark Images:Image1 REJECTED,	B/C=1.363768, No.0009
IMAGE FILE Hard Disk:OPTIX:tt,images,L59 REJECTED,	B/C=0.949037, No.0032
IMAGE FILE Hard Disk:OPTIX:Good Images:Image6 REJECTED,	B/C=1.326800, No.0006
IMAGE FILE Hard Disk:OPTIX:tt,images,L68 REJECTED,	B/C=1.088773, No.0041
IMAGE FILE Hard Disk:OPTIX:tt,images,L57 REJECTED,	B/C=1.319862, No.0029
IMAGE FILE Hard Disk:OPTIX:Good Images:Image1 REJECTED,	B/C=1.115814, No.0000
IMAGE FILE Hard Disk:OPTIX:tt,images,L72 REJECTED,	B/C=1.309576, No.0045

Sample: Ranking Reject Report

The Batch Control file was set to reject 90 percent of the batch starting with the most extreme values and moving toward the center or average B/C. This report is interspersed with the individual image reports. In practice, a more normal percentage might be 5 to 10.

STANDARD DEVIATION: 0.301408
ACCEPTED on review

EVALUATING IMAGE #0008 FILE: Hard Disk:Images:Good Images:Image8
BLACK COUNT: C412
G4 FILE SIZE 8551
B/C VALUE: 1.470714
MEAN B/C: 1.277718
B/C VARIES FROM AVG BY: 0.192996
STANDARD DEVIATION: 0.293088
ACCEPTED

RE-EVALUATING IMAGE #0005 FILE: Hard Disk:Images:Good Images:Image5
B/C VALUE: 1.462168
MEAN B/C: 1.277718
B/C VARIES FROM AVG BY: 0.184449
STANDARD DEVIATION: 0.293088
ACCEPTED on review

RANKING IMAGES...REJECTING 002 OUT OF 009 IMAGES
IMAGE FILE Hard Disk:Images:Good Images:Image1 REJECTED, B/C=1.115814, No.0000
IMAGE FILE Hard Disk:Images:Good Images:Copy of Ima REJECTED, B/C=1.527753, No.0003

EVALUATING IMAGE #0009 FILE: Hard Disk:Images:Dark Images:Image1
BLACK COUNT: F755
G4 FILE SIZE B55C
B/C VALUE: 1.363768
MEAN B/C: 1.285541
B/C VARIES FROM AVG BY: 0.078227
STANDARD DEVIATION: 0.280541
ACCEPTED

RE-EVALUATING IMAGE #0006 FILE: Hard Disk:Images:Good Images:Image6
B/C VALUE: 1.326800
MEAN B/C: 1.285541
B/C VARIES FROM AVG BY: 0.041259
STANDARD DEVIATION: 0.280541
ACCEPTED on review

EVALUATING IMAGE #0010 FILE: Hard Disk:Images:Dark Images:Image2
BLACK COUNT: BF5B
G4 FILE SIZE 6748
B/C VALUE: 1.852761
MEAN B/C: 1.332809
B/C VARIES FROM AVG BY: 0.519952
STANDARD DEVIATION: 0.311002
REJECTED

RE-EVALUATING IMAGE #0007 FILE: Hard Disk:Images:Good Images:Image7
B/C VALUE: 1.494251
MEAN B/C: 1.332809
B/C VARIES FROM AVG BY: 0.161441
STANDARD DEVIATION: 0.311002

ACCEPTED on review

EVALUATING IMAGE #0011 FILE: Hard Disk:Images:Dark Images:Image3
BLACK COUNT: 17B0C
G4 FILE SIZE E11A
B/C VALUE: 1.683893
MEAN B/C: 1.359816
B/C VARIES FROM AVG BY: 0.324077
STANDARD DEVIATION: 0.313104
ACCEPTED

RE-EVALUATING IMAGE #0008 FILE: Hard Disk:Images:Good Images:Image8
B/C VALUE: 1.470714
MEAN B/C: 1.359816
B/C VARIES FROM AVG BY: 0.110898
STANDARD DEVIATION: 0.313104
ACCEPTED on review

EVALUATING IMAGE #0012 FILE: Hard Disk:Images:Dark Images:Copy of Image3
BLACK COUNT: 66D7
G4 FILE SIZE 394F
B/C VALUE: 1.794493
MEAN B/C: 1.390864
B/C VARIES FROM AVG BY: 0.403628
STANDARD DEVIATION: 0.321813
REJECTED

RE-EVALUATING IMAGE #0009 FILE: Hard Disk:Images:Dark Images:Image1
B/C VALUE: 1.363768
MEAN B/C: 1.390864
B/C VARIES FROM AVG BY: 0.027097
STANDARD DEVIATION: 0.321813
ACCEPTED on review

EVALUATING IMAGE #0013 FILE: Hard Disk:Images:Dark Images:Image4
BLACK COUNT: 17C97
G4 FILE SIZE E3C8
B/C VALUE: 1.634968
MEAN B/C: 1.407138
B/C VARIES FROM AVG BY: 0.227830
STANDARD DEVIATION: 0.316807
ACCEPTED

RE-EVALUATING IMAGE #0010 FILE: Hard Disk:Images:Dark Images:Image2
B/C VALUE: 1.852761
MEAN B/C: 1.407138
B/C VARIES FROM AVG BY: 0.445623
STANDARD DEVIATION: 0.316807
REJECTED on review

EVALUATING IMAGE #0014 FILE: Hard Disk:Images:Dark Images:Image5
BLACK COUNT: C026
G4 FILE SIZE 6403
B/C VALUE: 1.921259

B/C VALUE: 1.921259
MEAN B/C: 1.549656
B/C VARIES FROM AVG BY: 0.371604
STANDARD DEVIATION: 0.412552
ACCEPTED on review

RANKING IMAGES...REJECTING 002 OUT OF 009 IMAGES
IMAGE FILE Hard Disk:Images:Dark Images:Image1 REJECTED, B/C=1.363768, No.0009
IMAGE FILE Hard Disk:Images:Dark Images:Image7 REJECTED, B/C=2.445409, No.0016

EVALUATING IMAGE #0018 FILE: Hard Disk:Images:Light Images:Image1
BLACK COUNT: 7940
G4 FILE SIZE A143
B/C VALUE: 0.751883
MEAN B/C: 1.509767
B/C VARIES FROM AVG BY: 0.757884
STANDARD DEVIATION: 0.438087
REJECTED

RE-EVALUATING IMAGE #0015 FILE: Hard Disk:Images:Dark Images:Image6
B/C VALUE: 2.213266
MEAN B/C: 1.509767
B/C VARIES FROM AVG BY: 0.703499
STANDARD DEVIATION: 0.438087
REJECTED on review

EVALUATING IMAGE #0019 FILE: Hard Disk:Images:Light Images:Image2
BLACK COUNT: 48C5
G4 FILE SIZE 5191
B/C VALUE: 0.892151
MEAN B/C: 1.480357
B/C VARIES FROM AVG BY: 0.588206
STANDARD DEVIATION: 0.447304
REJECTED

RE-EVALUATING IMAGE #0016 FILE: Hard Disk:Images:Dark Images:Image7
B/C VALUE: 2.445409
MEAN B/C: 1.480357
B/C VARIES FROM AVG BY: 0.965053
STANDARD DEVIATION: 0.447304
REJECTED on review

EVALUATING IMAGE #0020 FILE: Hard Disk:Images:Light Images:Image3
BLACK COUNT: 81FF
G4 FILE SIZE B349
B/C VALUE: 0.725080
MEAN B/C: 1.446026
B/C VARIES FROM AVG BY: 0.720946
STANDARD DEVIATION: 0.464474
REJECTED

RE-EVALUATING IMAGE #0017 FILE: Hard Disk:Images:Dark Images:Image8
B/C VALUE: 1.756459

Huffman VR2: 1116
Huffman VR3: 318

Verticality Index (Low number = high verticality): 0.106

Conclusion: This image appears to be good.

FILENAME: Image8

Pixel Width:	1696	
Pixel Length:	2200	
Pixel Total:	3731200	
Black Pixels:	401558	(about 10% of Total Pixels)
White Pixels:	3329642	(about 89% of Total Pixels)
Black Orphans:	28	(about 0% of Total Black)
White Orphans:	27	(about 0% of Total White)

Ratio of black orphans to total white pixels: 0.000008
Ratio of white orphans to total black pixels: 0.000067

Huffman HORZ: 5220
Huffman PASS: 3623
Huffman V0: 95679
Huffman VL1: 12013
Huffman VL2: 1346
Huffman VL3: 312
Huffman VR1: 11223
Huffman VR2: 1560
Huffman VR3: 447

Verticality Index (Low number = high verticality): 0.072

Conclusion: This image appears to be good.

FILENAME: Image1

Pixel Width:	1696	
Pixel Length:	2200	
Pixel Total:	3731200	
Black Pixels:	506536	(about 13% of Total Pixels)
White Pixels:	3224664	(about 86% of Total Pixels)
Black Orphans:	493	(about 0% of Total Black)
White Orphans:	38	(about 0% of Total White)

Ratio of black orphans to total white pixels: 0.000153
Ratio of white orphans to total black pixels: 0.000075

Huffman HORZ: 8891
Huffman PASS: 5948
Huffman V0: 99768
Huffman VL1: 16347
Huffman VL2: 1927

Pixel Total: 3731200
Black Pixels: 139197 (about 3% of Total Pixels)
White Pixels: 3592003 (about 96% of Total Pixels)
Black Orphans: 678 (about 0% of Total Black)
White Orphans: 81 (about 0% of Total White)

Ratio of black orphans to total white pixels: 0.000189
Ratio of white orphans to total black pixels: 0.000582

Huffman HORZ: 5855
Huffman PASS: 4162
Huffman V0: 29117
Huffman VL1: 5032
Huffman VL2: 1286
Huffman VL3: 561
Huffman VR1: 5322
Huffman VR2: 1144
Huffman VR3: 342

Verticality Index (Low number = high verticality): 0.234

Conclusion: Bad Image (white speckles in black areas)

FILENAME: Image6

Pixel Width: 1696
Pixel Length: 2200
Pixel Total: 3731200
Black Pixels: 88643 (about 2% of Total Pixels)
White Pixels: 3642557 (about 97% of Total Pixels)
Black Orphans: 36 (about 0% of Total Black)
White Orphans: 27 (about 0% of Total White)

Ratio of black orphans to total white pixels: 0.000010
Ratio of white orphans to total black pixels: 0.000305

Huffman HORZ: 2433
Huffman PASS: 1668
Huffman V0: 23689
Huffman VL1: 3232
Huffman VL2: 563
Huffman VL3: 269
Huffman VR1: 2905
Huffman VR2: 567
Huffman VR3: 222

Verticality Index (Low number = high verticality): 0.130

Conclusion: Bad Image (white speckles in black areas)

FILENAME: Image7